

- Fig. 11. Magnified view of mature proglottis of *D. urogalli*. *gp.*, genital pore; *ov.*, ovary; *p.*, penis; *t.*, testes; *v.*, vagina; *vit.*, vitellarium; *w.v.*, excretory system.
12. Ova of *D. urogalli*, showing the ovum and yolk-vesicles.
13. Longitudinal horizontal section through the same, showing the great extension of the excretory transverse canals, and the ova scattered in egg-capsules.

PLATE LX.

- Fig. 14. A similar section through the last proglottis, showing the enormous transverse canal at the level of the breaking zone and the excretory pore *e.p.*
15. Ova of *D. urogalli* more advanced than those shown in fig. 12, showing the onchosphere and traces of the yolk-vesicles.
16. An isolated hook from the same.
17. Transverse section of the walls of intestine of a fowl, showing *Tenia botriopliti* embedded in the deeper layers of the intestinal wall. *aa.*, intestinal mucosa; *b.*, muscular layers; *sp.*, peritoneal lining; *tt.*, anterior ends of the tape-worms; *e.*, mass of exudate produced by the irritation of the head of the *Tenia*. (From Piana, Mem. Ac. Sci. Istit. Bologna, series 4, vol. ii. 1880, p. 387.)
18. Head of *Hymenolepis microps* (Diesing), highly magnified.
19. Section through the retracted proboscis of the same, highly magnified to show the arrangement of the hooks.
20. Isolated hooks of the same seen under $\frac{1}{3}$ oil immersion-lens.
21. A few mature proglottides of the same, taken from about the middle of the body.
22. Onchospheres of *H. microps* in the characteristic three envelopes.
23. Hooks from the same.

4. Internal Parasites of Birds allied to the Grouse. By
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The following is a brief enumeration of the Cestode, Trematode, and Nematode parasites of the Grouse, the Ptarmigan, the Blackcock, and the Capercaillie. To these I have added the Willow-grouse and the Hazel-hen, although these birds, unlike the three former, are not denizens of the British Isles. It will be noticed that but two Nematodes, *Trichosoma longicolle* (Rud.) and *Heterakis papillosa* (Bloch), and two Cestodes, *Davainea urogalli* and *Hymenolepis microps*, are common to our grouse and to its allies. The first named round worm and the tape-worm are found in all three, Blackcock, Capercaillie, and Grouse, and in none of the other nearly allied birds; whilst *Heterakis papillosa* has been recorded from the Ptarmigan, the Capercaillie, the Hazel-hen and the Grouse, besides from many other birds.

Heterakis perspicillum (Rud.) also occurs in three hosts, in the Blackcock, the Hazel-hen, and the Capercaillie. All the other Nematode parasites mentioned occur in a single host, except *Heterakis compar* (Schrank) which is found in both the Ptarmigan and the Capercaillie. Of the Cestodes, *Davainea urogalli* and *Hymenolepis microps* occur in the Grouse, the Blackgame, and the Capercaillie.

I. LAGOPUS MUTUS Leach, or L. ALPINUS. The Ptarmigan.

The Ptarmigan contains *Heterakis (Ascaris) compar* (Schrank), *Heterakis papillosa* (Bloch), and *Heterakis borealis* (v. Linstow), amongst the Nematodes, and *Tenia echinata* amongst the Cestodes.

NEMATODA.

(i) *Heterakis compar* (Schrank).*

Synonyms. *Ascaris compar* Schrank 1790.
Ascaris lagopodis Fröhlich 1802.
Fusaria compar Zeder 1803.
Heterakis compar Stossich 1888.

A thin, white Nematode, the females of which attain a length of 84–96 mm., and the males a length of 36–48 mm., found in small intestine of the Ptarmigan, the Capercaillie, and other gallinaceous birds.

(ii) *Heterakis papillosa* (Bloch).

Synonyms. *Ascaris papillosa* Bloch 1872, nec Molin 1860.
Ascaris vesicularis Fröhlich 1791 *pro parte*.
Heterakis vesicularis Duj. 1845.
Heterakis papillosa Railliet 1885.

The male measures 7–13 mm., the female 10–15 mm. A very common parasite of the cæca of the alimentary canal. Sometimes it exists in prodigious numbers, causing a fatal perityphlitis amongst chickens.

This parasite is common in domestic fowls, ducks, geese, turkeys, peacocks, guinea-fowls, pheasants, etc., and occurs in the Ptarmigan, the Capercaillie, and the Hazel-hen (*Bonasia sylvestris*). The eggs of *H. papillosa* complete their development in water.

(iii) *Heterakis borealis* (v. Linstow).

Very little is known about this nematode, which was described in 1884 by von Linstow in the 'Archiv für Naturgeschichte,' l. (i.) p. 131.

CESTODA.

(i) *Tenia echinata* (Olss.).†

II. LAGOPUS ALBUS, or L. SUBALPINUS, or L. SALICETI. The Willow-grouse. I can find no record of any parasites being recorded from the Willow-grouse.

* Where possible the nomenclature follows that of Railliet in his "Zoologie Médicale et Agricole."

† Olsson, "Bidrag til Skandinav. Helminthfauna," ii, Stockholm, 1893.

III. *BONASIA SYLVESTRIS*. The Hazel-hen.*Tetrao bonasia* Linn.

NEMATODA.

(i) *Heterakis papillosa* (Bloch).v. under *Lagopus mutus*, p. 364.(ii) *Heterakis perspicillum* (Rud.).Synonyms. *Ascaris gallopavonis* Gmelin 1789.*Fusaria reflexa* Zeder 1800 *pro parte*.*Fusaria strumosa* Zeder 1800.*Ascaris perspicillum* Rud. 1803.*Ascaris gibbosa* Rud. 1809.*Ascaris inflexa* Rud. 1819 *pro parte*.*Ascaris funiculus* E. Deslongchamps 1824.*Heterakis inflexa* Schneider 1866.

Under the last synonym this worm has recently been recorded from the alimentary canal of a Russian Hazel-hen by Wolffhügel*. The males measure 3-8 cms., the females 6-12 cms. The worm is common in fowls, guinea-fowls, and turkeys, and gives rise to severe epizootics amongst poultry. Occasionally they are found free in the body-cavity, and sometimes occur in eggs, having made their way into the ovum before the shell is deposited.

(iii) *Filaria bonasice* (v. Nordmann).

This form apparently has been seen but once. It was found by v. Nordmann in the posterior chamber of the damaged eyes of a Hazel-hen taken in the island Wikari.

CESTODA.

(i) *Tenia bonasice* (Müller).

This tape-worm is recorded from the intestines, but practically nothing is known about it.

IV. *TETRAO TETRIS* L. Blackcock.

NEMATODA.

(i) *Trichosoma longicolle* (Rud.).

This is the worm (or one of them, more than one species may be included in Rudolphi's original description) described by Rudolphi. It occurs in the fowl, pheasant, and grouse as well as in blackgame, v. p. 345.

(ii) *Heterakis compar* (Schrank).†

v. p. 364.

* "Beitrag zur Kenntniss der Vogelhelminthen," Inaug.-Diss., Freiburg i. B., 1900.

† Müller, Arch. Naturg. 1897, p. 10, and Stossich, "Glasnik. Naravosl. druzt." 1887, p. 287.

(iii) *Heterakis perspicillum* (Rud.).*

v. p. 365.

(iv) *Heterakis magnopapilla* (v. Linstow). †

(v) *Strongylus papillatus* (v. Linstow). ‡

Wolffhügel found both males and females in great numbers in the alimentary canal of the Blackcock. It had previously been described by v. Linstow from the intestine of the Great Bustard, *Otis tarda*.

(vi) *Strongylus hastatus* (v. Linstow). §

(vii) Nematode ? genus, recorded by Wolffhügel from the cæca.

TREMATODA.

(i) *Lyperosomum corrigia* (Braun). ||

A fluke nearly allied to *Distomum plesiostrum* (v. Linstow, 1883) from *Perdix græca*.

CESTODA.

(i) *Davainea retusa* (Clerc). ¶

(ii) *Davainea urogalli* (Modeer).

Described by Krabbe from specimens in *Perdix græca*, *Megaloperdix nigelli*, *Tetrao urogallus* and *T. tetriv*.

(iii) *Davainea villosa* (Bloch).

Also found in a *Megaloperdix nigelli* in Turkestan.

(iv) *Hymenolepis microps* (Diesing).**

This species, described by Wolffhügel under the name of *H. tetraonis* from a few fragments, is more fully described by me from *Lagopus scoticus* in the anatomical part of this memoir, cf. p. 358.

ACANTHOCEPHALA.

(i) *Echinorhynchus stellaris* (Molin).

Usually found in the Duck, but Dr. von Linstow tells me he has seen it in the larval stage encysted on the outside wall of the intestine in the Blackcock.

* "Glasnik. Naravosl. druzt." (Societas historico-naturalis Croatica), Zagreb, 1887, p. 278.

† "Schr. Ges." Königsb. xlvii. 1906, p. 112.

‡ Arch. Naturg., 1882 (i), p. 3.

§ Ibid., 1905, p. 274.

|| Centrbl. Bakter. xxix. 1901, p. 946.

¶ Rev. Suisse Zool., xi. 1903, p. 363.

** "Beitrag zur Kenntniss der Vogelhelminthen," Freiburg i. B., 1900.

V. TETRAO UROGALLUS L. The Capercaillie.

NEMATODA.

- (i) *Heterakis compar* (Schrank), v. p. 364.
- (ii) *Heterakis papillosa* (Bloch), v. p. 364.
- (iii) *Heterakis perspicillum* (Rud.), v. p. 365.
- (iv) *Filaria urogalli* (v. Linstow).
Lives in the subcutaneous tissues.
- (v) *Trichosoma longicolle* (Rud.), v. p. 345.

CESTODA.

- (i) *Bothriocephalus* sp.

Cobbold* found in the subcutaneous tissue lying over the pectoral muscles of a Capercaillie a single specimen of a tape-worm which he compared with a *Ligula reptans*. It was probably a larval *Bothriocephalus*.

- (ii) *Davainea urogalli* (Modeer), v. p. 351.
- (iii) *Davainea globocaudata* (Cohn).†
- (iv) *Hymenolepis microps* (Diesing).

LIST OF PARASITES WITH THEIR HOSTS.

NEMATODA.	HOST.
<i>Filaria bonasice</i> (v. Nordm.) ...	<i>Bonasia sylvestris</i> .
<i>Filaria urogalli</i> (v. Lins.)	<i>Tetrao urogallus</i> .
<i>Filaria</i> sp.	<i>Lagopus scoticus</i> .
<i>Heterakis borealis</i> (v. Lins.) ...	<i>Lagopus mutus</i> .
<i>Heterakis compar</i> (Schrank) ...	<i>Lagopus mutus</i> , <i>Tetrao tetrix</i> , and <i>Tetrao urogallus</i> .
<i>Heterakis papillosa</i> (Bloch).....	<i>Lagopus mutus</i> , <i>Lagopus scoti-</i> <i>cus</i> , <i>Tetrao urogallus</i> , and <i>Bonasia sylvestris</i> .
<i>Heterakis perspicillum</i> (Rud.)...	<i>Tetrao tetrix</i> , <i>Tetrao urogallus</i> , and <i>Bonasia sylvestris</i> .
<i>Heterakis magnopapilla</i> (v. Lins.)	<i>Tetrao tetrix</i> .
<i>Strongylus papillatus</i> (v. Lins.)	<i>Tetrao tetrix</i> .
<i>Strongylus hastatus</i> (v. Lins.)...	<i>Tetrao tetrix</i> .
<i>Syngamus trachealis</i> (v. Sieb.)	<i>Lagopus scoticus</i> .
<i>Trichosoma longicolle</i> (Rud.) ...	<i>Tetrao tetrix</i> , <i>Tetrao urogallus</i> , and <i>Lagopus scoticus</i> .
<i>Trichostrongylus pergracilis</i> (Cobb.)	<i>Lagopus scoticus</i> .
Nematode gen.....	<i>Tetrao tetrix</i> .

* Tr. Linn. Soc. London, xxii. p. 165.

† Zool. Anz. xxiii. 1900, p. 91, and Acta Ac. German. lxxix. 1901, p. 263.

TREMATODA.

HOST.

Lyperosomum corrigia (Braun) *Tetrao tetrix*.

CESTODA.

Bothriocephalus sp. *Tetrao urogallus*.
Davainea cesticillus (Molin) ... *Lagopus scoticus*.
Davainea globocaudatus (Cohn) *Tetrao urogallus*.
Davainea retusa (Clerc) *Tetrao tetrix*.
Davainea urogalli (Modeer) ... *Tetrao tetrix*, *Tetrao urogallus*,
and *Lagopus scoticus*.
Davainea villosa (Bloch) *Tetrao tetrix*.
Hymenolepis microps (Diesing) *Tetrao tetrix*, *Tetrao urogallus*,
and *Lagopus scoticus*.
Tenia bonasiæ (Müll.) *Bonasia sylvestris*.
Tenia echinata (Olss.) *Lagopus mutus*.

ACANTHOCEPHALA.

Echinorhynchus stellaris (Molin) *Tetrao tetrix*.

5. On a Fossil Bird from the Lower Pliocene.

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(Text-figure 47.)

The following account concerns the fossilized remains of a small Passerine bird from the Lower Pliocene of Gabbro, near Leghorn. The slab in which these remains are embedded was placed in my hands for investigation by my friend Dr. Forsyth Major, F.R.S., who has, throughout my enquiry, rendered me much help.

Unfortunately, only the pelvic limbs and a few traces of feathers are here preserved; further, the bones are much crushed, and the phalanges have been almost entirely lost. But from the slab and its counterpart, which has happily been preserved, sufficient details may be gathered to make identification possible.

The right leg lacks the toes. The femur, on the slab, is much crushed and can only very imperfectly be traced; but on the counterpart of the slab it becomes clear that it is seen from its dorsal aspect, since the middle of the shaft shows a smooth, periosteal, surface; while the extremities thereof are missing, leaving beautiful impressions of the distal and proximal articular ends. The tibio-tarsus is seen from its fibular side. Herein traces are visible of the head of the fibula, closely approximated to the femoral trochlea, and of the external border of the ectocnemial

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